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1. Introduction

In this report we present the technical specifications of the Common Coastal Web GIS system development, its functionality and the server purchase technical specification used for the Web GIS within the HERMES framework. Moreover, we present sample time series plots from the on line provided in-situ data of the HERMES observing buoy network and maps with the CMEMS met-ocean forecasts in the four domains of the project, in Albania, Bulgaria, Cyprus and Greece. The beta version of the HERMES web GIS was presented during the HERMES meeting held in Albania in July 2019.



Figure 1: The HERMES observing buoy network from where in-situ data for sea currents and waves are provided online for visualization and data management by the Common coastal Web GIS system developed in the framework of the project.



Figure 2: The HERMES domain for which CMEMS and downscaled met-ocean forecasts are provided for visualization and management by the Common coastal Web GIS system developed in the framework of the project.

1. THE HERMES Common Coastal Web GIS system

1.1. Web GIS System description and Technical Specifications

In the frame of the HERMES project was required and has been developed a web GIS user interface with a unique web point providing access to the in-situ and remote sensed HERMES buoy observational network and CMEMS forecasting data from the project coastal areas of interest in Albania, Bulgaria, Cyprus and Greece, to suit the requirements of HERMES project and the generic users.

The Web GIS system requested to provide 5 main service scenarios:

1. visualization of the in-situ monitoring data from the 4 buoys should be deployed in Cyprus, Greece, Bulgaria and Albania for the needs of the HERMES project;
2. visualization of the met-ocean forecasting and hind cast data for the HERMES coastal areas of interest in Cyprus, Greece, Bulgaria and Albania using the CMEMS forecasts;
3. Visualization of the satellite images of the HERMES project areas of interest showing the coastline changes;
4. archiving of the QCed in-situ data of the buoys following the EU SeaDataNet standards and format;
5. archiving of the met-ocean forecasting data for the HERMES coastal areas in netcdf format.

1.2. Features of the Web GIS user interface

The final Web GIS interface should be interfaced with a local data repository, which will provide access to the following data via ftp / http :

- In-situ data from the buoys, which will be stored in the dedicated database.
- Forecasting data from CMEMS forecasts for the HERMES domains in netcdf format.
- Forecasting data from atmospheric models for the HERMES domains in netcdf format.
- Data from satellites (geoTiff format) used for identification of the coastal erosion in the HERMES areas.
- Data will be stored in netCDF, geoTiff or ASCII in a dedicated database.
- Use Mapserver for visualization of maps and time series plots.
- The interface must be operated using modern browsers (e.g. Google Chrome).

- The interface to be developed as a client server architecture with open source database and map services.
- Python scripts to be used for netCDF data processing and visualization.

The Web GIS user interface provide access to the main service scenarios and cover the following cases: single point single parameter time series, single point and multiple parameters time series, single polygon and mixed sources (point and polygon).

1.3. The Web GIS user interface

The Web GIS interface allow

- the visualization of the in-situ, satellite and met- ocean forecasting/hind cast data in the HERMES areas of interest;
- the functionality to export output into shape files/or other formats according to OGC standards (Open Geospatial Consortium) that can be used by GIS package(s).
- to provide Help Buttons for a user-friendly access to the system.
- the virtual machine to be installed on a dedicated server obtained within the framework of the HERMES project and is hosted by the ORION HERMES partner.

The Web GIS user interface is implemented in cooperation with all the HERMES partners, who will provide via ftp their in-situ data from the buoys and forecasting data in the HERMES areas.

2. HERMES WEB GIS Structure

The system as it shown in Figure 1 has been developed using client-server architecture.

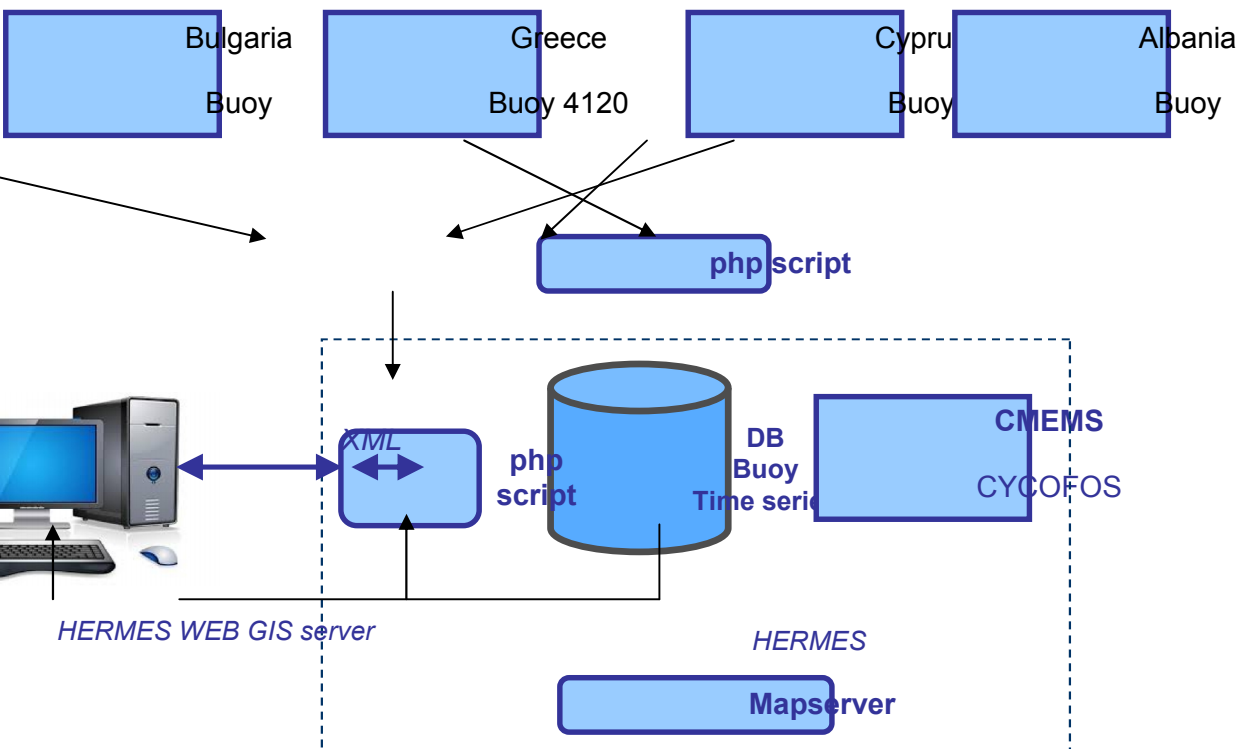


Figure 3. HERMES Web GIS structure.

Client part is presented by the Front End with a user friendly interface, which is developed at the base of HTML 5 with using jQuery and OpenLayers.

jQuery provides the main interface functions and create time series plots.

OpenLayers used to create map tools and visualization.

2.1 Web GIS User interface capabilities

The user's first step is to select the region of interest. The result will be presented by zooming of selected region for the data visualisation.

The User interface provides the capability to make requests for buoy data and forecasting data from CMEMS and downscaled CYCOFOS. Also it provides the visualization of the requested data. Buoy data are presented as time series for the last 5 days for each buoy parameter. The user has the option to select dates and in-situ parameter.

The online provided buoy in-situ data parameters for waves and sea currents for the HERMES buoy 4120 at Kariani, North Greece managed by the HERMES Web GIS system are:

Current Speed at 0m (m/s)	Directional variance at peak period (sec)
Current Direction at 0m (deg)	Maximum Wave (m)
Current Speed at 2.5m (m/s)	Mean 1/3 Largest Waves (m)
Current Direction at 2.5m (deg)	Mean 1/10 Largest Waves (m)
Current Speed at 5m (m/s)	Mean Direction (deg)
Current Direction at 5m (deg)	Mean Hydrostatic Pressure (bar)
Current Speed at 7.5m (m/s)	Peak Period (sec)
Current Direction at 7.5m (deg)	Mean Period (Direct Measurement) (sec)
Current Speed at 10m (m/s)	Mean Period (Spectra Equivalent) (sec)
Current Direction at 10m (deg)	Wave Peak Period (sec)
Current Speed at 12.5m (m/s)	Near Surface Current Direction (deg)
Current Direction at 12.5m (deg)	Near Surface Current Speed (m/s)
Current Speed at 15m (m/s)	Number of No Detects (numb)
Current Direction at 15m (deg)	Significant Wave Height (m)
Current Speed at 17.5m (m/s)	
Current Direction at 17.5m (deg)	
Current Speed at 20m (m/s)	
Current Direction at 20m (deg)	
Current Speed at 22.5m (m/s)	
Current Direction at 22.5m (deg)	

Table 1: Waves and sea currents parameters provided by the HERMES buoy 4120, deployed at Kariani, North Greece, for visualization and data management by the HERMES Web GIS system.

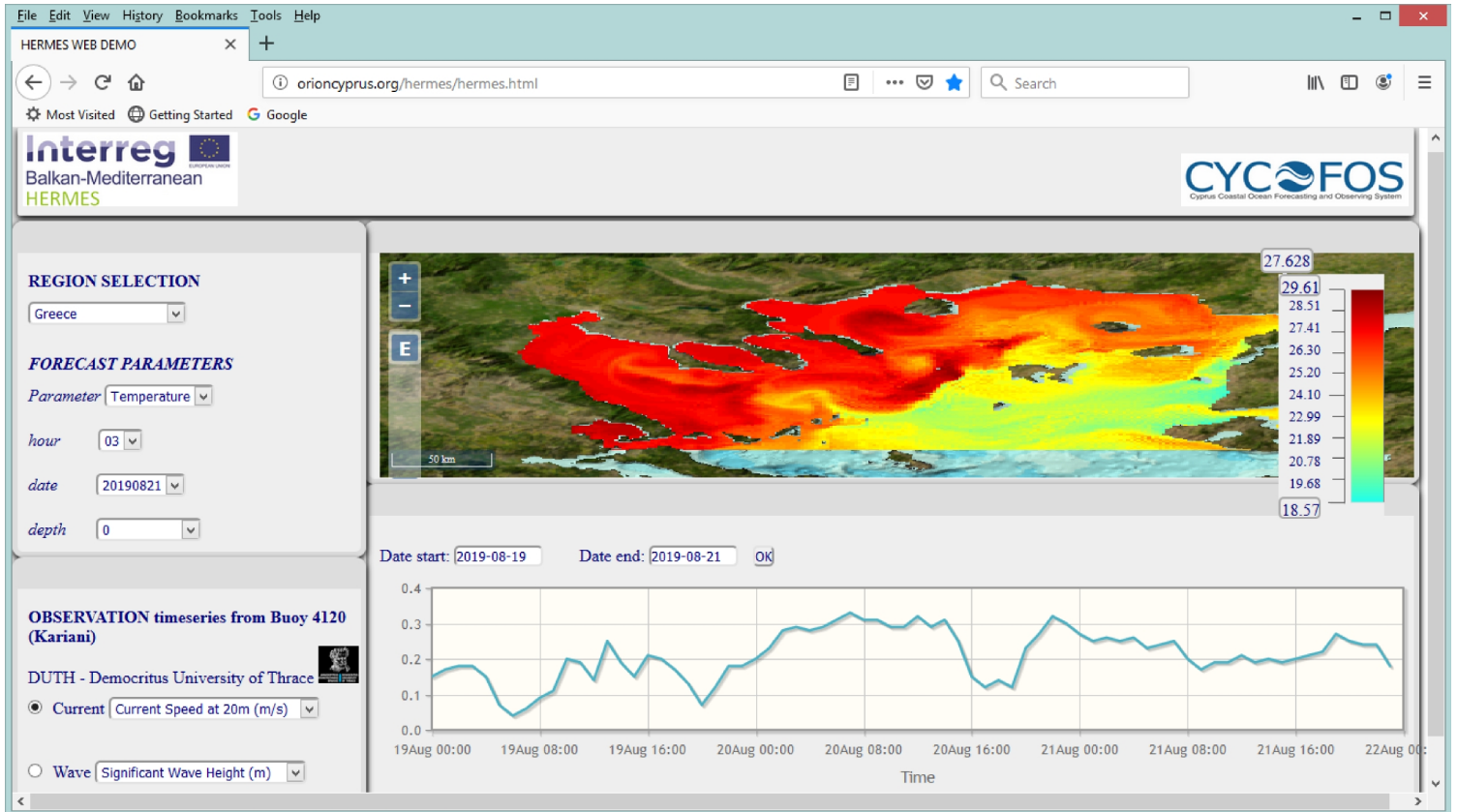


Figure 4: Example of the HERMES Web GIS system showing the downscaled CYCOFOS forecast of the sea surface temperature at 03:00 UTC of the 21 August 2019, and the time series of the sea currents fat the depth of 20 meter from the HERMES observing buoy 4120 from 19 to 22 August July 2019. The above in-situ data provided operationally from the buoy 4120 deployed at Kariani (North Aegean Sea) by the project partner DUTH.

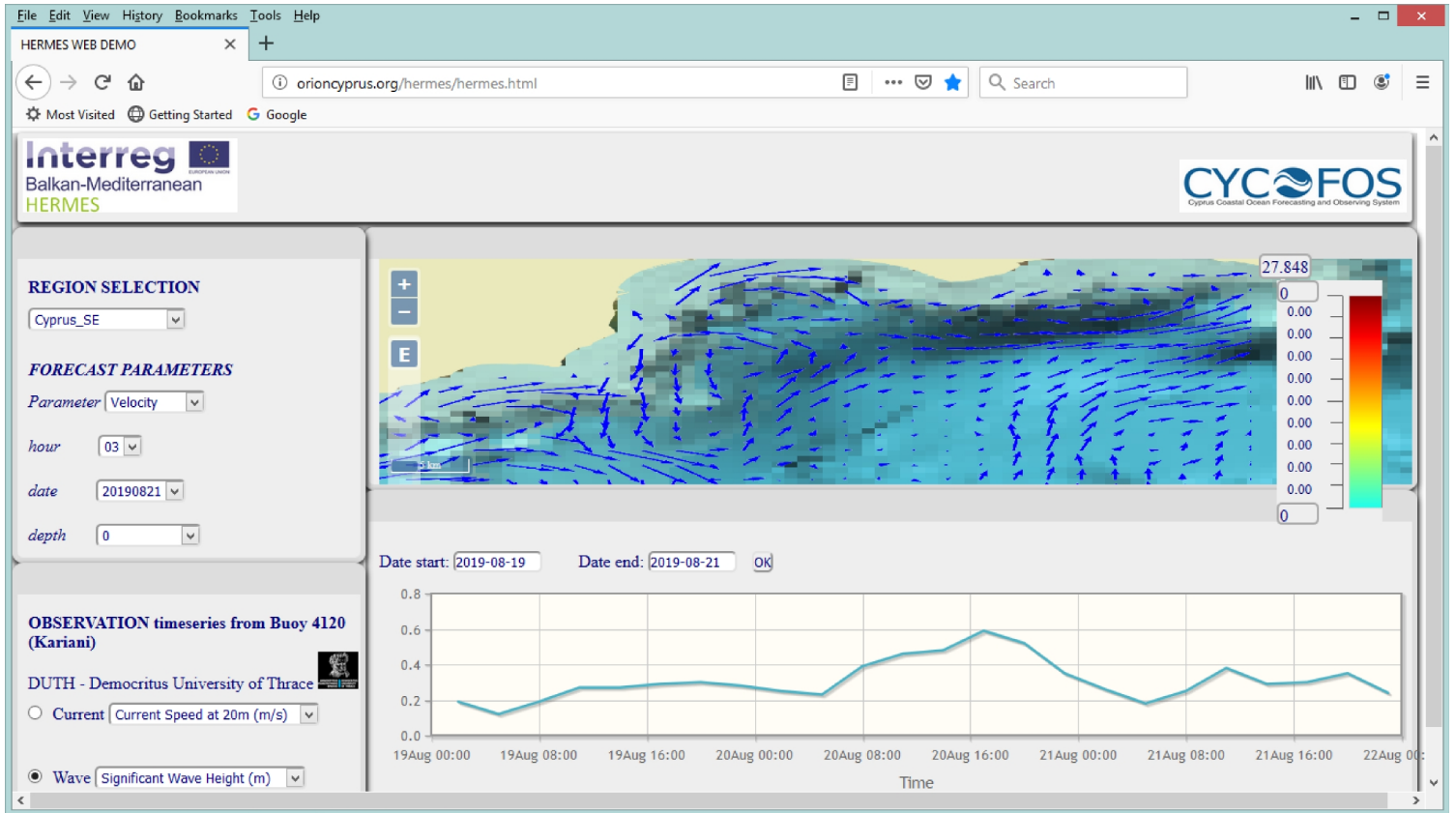


Figure 5 : Example of the HERMES Web GIS system showing the downscaled CYCOFOS forecast of the sea surface currents at 03:00 UTC of the 21 August 2019 in the Larnaca bay and the broad southeast coastal area of Cyprus, and the time series of the significant wave height from the HERMES observing buoy 4120 from 19 to 22 August July 2019. The above in-situ data provided operationally from the buoy 4120 deployed at Kariani (North Aegean Sea) by the project partner DUTH.

The Web GIS system will provide the user the capability to download of selected data in SeaDataNet ODV format. The CMEMS and CYCOFOS forecasting parameters available for online visualization and data management from Web GIS in the 4 areas of the HERMES projects are : sea temperature, salinity and sea currents, waves, winds for 5 days before and 5 days with 6 hours time interval and with up to 15 water layer for the hydrodynamical forecasting parameters.

The dedicated **server** for the Web GIS purchased within the HERMES project includes : Web server, Mapserver, MySQL database, php and python scripts, CMEMS and CYCOFOS forecast files, buoy in-situ data base. Mapserver is using CMEMS and CYCOFOS data visualization.

MySQL database keeps the HERMES buoy data.

On a daily base the php-script downloads the in-situ buoy data from the HERMES DUTH partner ftp server to the data base of the Web GIS. The data from the HERMES buoy 4120 deployed at Kariani in the North Aegean are kept in the file name "buoy_4120". This file includes all buoy's 4120 data parameter and date-time of the measurements. Similar files will be created for all the HERMES buoy network.

Moreover, the new CMEMS and CYCOFOS forecasting data in the HERMES domains are loaded to HERMES Web GIS server. Python scripts process these data to select necessary regions and generate geoTiff files which are used for the visualization of these forecasting data by Mapserver.

The user request is operated by php data exchange scripts and the MySQL DB request was generated. After the accomplishment of the user request, the corresponded time series data are selected and the results are sent to the online HERMES Web GIS User Interface for their visualization.

3. Technical specification of the dedicated server for the Common coastal Web GIS system

The Web GIS system is installed on a dedicated server located at ORION's premises connected to the Internet by means of a dedicated line. The amount of daily data collected by: a) the four HERMES buoy network from Greece, Bulgaria, Albania and Cyprus, b) the CMEMS and CYCOFOS daily forecasting data collected in the 4 domains (Figure 2) from the above mentioned countries and c) the processing power needed by the Web GIS system in order to provide the real time visualization of the system results, require an adequate hardware system. In this respect the hardware installation has the following specifications.

- 2 x Intel Xeon Processor E5-2630V4 (2.20 GHz, 25 MB cache, TenCore, HT, Turbo-Boost up to 3.10 GHz)
- 256 GB DDR4-RAM (8x 32 GB DIMM PC4-19200 ECC Reg.)
- 3x 6 TB HGST UltraStar 7K6000 Enterprise SAS (128 MB cache, 7,200 rpm, SAS 12Gb/s)
- 800 GB Intel SSD DC P3600 Series (PCIe Card, 2600 MB/s read, 1000 MB/s write, 430000 IOPS, S-ATAe NVMe)
- MegaRAID SAS 3108 on board Controller
- 2 x 200 GB Intel SSD DC S3710 Series (85,000 IOPS, 10 DWD, 3600 TBW, HET-MLC)
- Slim-Line DVD-Writer
- High-efficiency redundant power supply
- Network interface on Board
- 2 x 256 GB SSD 850 Pro (100,000 IOPS, 150 TBW, 3D V-NAND)

4. Conclusions

The ORION HERMES partner has developed the beta version of a Common coastal Web GIS system which visualize in operational mode the in-situ sea currents and waves data from the HERMES observing buoy network, deployed in the four participating countries.

Moreover, the Web GIS system provides the visualization of the forecasting sea currents, temperature, salinity, waves and winds data from the Copernicus CMEMS MFC Med, the CMEMS MFC Black Sea and the CYCOFOS in the coastal areas of the HERMES project. Furthermore, the Web GIS system will provide the possibility to freely access and download the observed in-situ data of the HERMES observing buoy network.

A wide variety of end-users will benefit from the HERMES Web GIS system providing solid marine data and information useful to professionals and private individuals working in the fields of Coastal Zone Management, coastal fisheries, recreational coastal facilities, tourist industry, scuba divers, coastal navigation and sailing, search and rescue, local port authorities, marinas, fisheries shelters and many others.

The beta version of the HERMES project Web GIS can be accessed from the link:

<http://orioncyprus.org/hermes/hermes.html>

while a new link for better dissemination and visibility has been created:

<http://hermes/orioncyprus.org/hermes.html>